Notice No.4

Rules and Regulations for the Classification of Ships, July 2016

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Issue date: December 2016

Amendments to	Effective date	Mandatory Instrument
Part 3, Chapter 2, Sections 1 & 2	1 January 2017	X
Part 3, Chapter 3, Section 4	1 January 2017	
Part 3, Chapter 9, Section 6	1 January 2017	
Part 3, Chapter 10, Section 2	1 January 2017	
Part 3, Chapter 12, Section 2	1 January 2017	X
Part 3, Chapter 13, Sections 3, 7 & 8	1 January 2017	
Part 4, Chapter 2, Sections 3 & 11	1 January 2017	
Part 4, Chapter 3, Sections 1 & 9	1 January 2017	
Part 4, Chapter 8, Sections 1 & 2	1 January 2017	X

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Part 3, Chapter 2
Materials

■ *Section 1*
Materials of construction

1.2 Steel

1.2.5 For container ships only, a k_L factor of 0,66 may be applied to steel with a specified minimum yield stress of 390 N/mm^2, or a k_L factor of 0,62 may be applied to steel with a specified minimum yield stress of 460 N/mm^2 for structural members that contribute to the ship's longitudinal strength, provided that:

(a) the member's plate or web thickness is greater than 50 mm, *see* also *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates*;
(b) the requirements of *Pt 3, Ch 2, 1.2 Steel 1.2.4* are satisfied; and
(c) a spectral fatigue assessment is carried out in accordance with *ShipRight Fatigue Design Assessment (FDA level 3) procedure*, to demonstrate that key structural details sensitive to the hull girder loads have satisfactory fatigue performance.
The assessment should normally include the following:
  - Hatch corners in way of cross-deck strips;
  - Hatch corners at the forward region;
  - Hatch corners forward and aft of the engine room and the accommodation blocks;
  - Connection of hatch coaming to supporting structure; and
  - Other critical locations subject to dynamic hull girder bending and torsional effects.

In addition, the *ShipRight Construction Monitoring (CM) procedure* is to be applied to the fatigue critical locations described above.

■ *Section 2*
Fracture control

2.1 Grades of steel

2.1.5 For container ships only, measures for the prevention of brittle fracture of thick plates are to be taken in accordance with the requirements of *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates*.

Part 3, Chapter 3
Structural Design

■ *Section 4*
Bulkhead requirements

~~4.7 Protection of tanks carrying fuel oil, lubricating oil, vegetable or similar oils~~

~~*4.7.1* Tanks carrying fuel oil or lubricating oil are to be separated by cofferdams from those carrying feed water, fresh water, edible oil or similar oils. Similarly, tanks carrying vegetable or similar oils are to be separated from those carrying fresh or feed water.~~

~~*4.7.2* Lubricating oil compartments are also to be separated by cofferdams from those carrying fuel oil. However these cofferdams need not be fitted provided that:~~
~~(a) Common boundaries of lubricating oil and fuel oil tanks have full penetration welds.~~
~~(b) The tanks are arranged such that the fuel oil tanks are not generally subjected to a head of oil in excess of that in the adjacent lubricating oil tanks.~~

~~*4.7.3* Cofferdams are not required between fuel oil double bottom tanks and deep tanks above, provided that the inner bottom plating is not subjected to a head of fuel oil.~~

~~*4.7.4* Where fitted, cofferdams are to be suitably ventilated.~~

~~*4.7.5* If fuel oil tanks are necessarily located within or adjacent to the machinery spaces, their arrangement is to be such as to avoid direct exposure of the bottom from rising heat resulting from an engine room fire, *see* SOLAS 1974 as amended *2.2.3 Oil fuel tanks*.~~

~~*4.7.6* In passenger ships, water ballast is, in general, not to be carried in tanks intended for fuel oil. Attention is drawn to the Statutory Regulations issued by National Authorities in connection with the *MARPOL - International Convention for the Prevention of Pollution from Ships*, 1973/78.~~

4.7 Separation and protection of tanks

4.7.1 Where the cross contamination of liquids stored in adjacent tanks is hazardous to machinery, these tanks are to be separated by cofferdams. Hazardous pairings of liquid consumables include but are not limited to the following:
(a) Fuel oil and lubricating oil;
(b) Fuel oil and technical water (e.g. feedwater);
(c) Lubricating oil and technical water;
(d) Fuel oil and urea.

4.7.2 Tanks carrying liquids for the purposes of fire fighting (e.g. foam concentrate) are to be separated by cofferdams from adjacent tanks containing liquid fuels.

4.7.3 Tanks carrying fresh water for human consumption (potable water) are to be separated by cofferdams from adjacent tanks containing liquid substances harmful to human health. Fresh water for other purposes and water ballast are not considered harmful.

4.7.4 Where a cofferdam as specified in *Pt 3, Ch 3, 4.7 Separation and protection of tanks 4.7.1* is impracticable, special consideration may be given, subject to the arrangements complying with the following:
(a) The thickness of common boundary plates is increased by 1 mm;
(b) Common boundaries have full penetration welds.

4.7.5 Where a corner to corner situation occurs, tanks are not considered to be adjacent.

4.7.6 Where fitted, cofferdams are to be suitably ventilated, provided with a suitable drainage arrangement, *see Pt 5, Ch 13, 3.4 Tanks and cofferdams*, and be of sufficient size to allow proper inspection, maintenance and safe evacuation.

4.7.7 If fuel oil tanks are necessarily located within or adjacent to the machinery spaces, their arrangement is to be such as to avoid direct exposure of the bottom from rising heat resulting from a machinery or hazardous space fire, *see also* SOLAS Regulation II-2/B4.2.2.3.2.

Existing paragraph 4.7.7 has been renumbered 4.7.8.

Part 3, Chapter 9
Special Features

■ *Section 6*
Lifting appliances and support arrangements

6.5 Support structure for life-saving appliances

6.5.1 The support structure for life-saving appliance davits and cranes is to be assessed on the basis of the maximum safe working load assigned and the ultimate strength of the materials used for construction.

6.5.2 The following load cases are to be considered as appropriate:
(a) Vertical forces acting on deck;
(b) Overturning moment;
(c) Slewing moment.

6.5.3 The load cases given in *Pt 3, Ch 9, 6.5 Support structure for life-saving appliances 6.5.2* are to be calculated based on the maximum safe working load of the davit and the requirements of the *International Life-Saving Appliance Code, Chapter VI, 6.1.1.* Each load case is to also consider the self-weight of the davit.

6.5.4 Both outboard and inboard load cases are to be considered together with intermediate positions as appropriate.

6.5.5 Support structure for appliances used for both life-saving and general shipboard operations are to be considered for both of these aspects.

6.5.6 The maximum permissible bending stress is to be taken as the lesser of:

(a) $\sigma_a = \dfrac{\sigma_U}{4{,}5}$ N/mm^2

(b) $\sigma_a = \dfrac{\sigma_o}{2{,}2}$ N/mm^2

where:

σ_U = ultimate tensile strength of material, in N/mm^2
σ_o = specified minimum yield stress or 0,2 per cent proof stress, in N/mm^2.

6.5.7 The maximum permissible shear stress is to be taken as the lesser of:

(a) $\tau_a = \dfrac{\sigma_U}{7{,}8}$ N/mm^2

(b) $\tau_a = \dfrac{\sigma_o}{3{,}8}$ N/mm^2

σ_U and σ_o are defined in *Pt 3, Ch 6, 6.5 Lifting appliances and support arrangements, 6.5.5.*

Existing sub-Section 6.5 *has been renumbered* 6.6*.*

Part 3, Chapter 10
Welding and Structural Details

■ *Section 2*
Welding

2.2 Fillet welds

(*Part only shown*)

Table 10.2.1 Weld factors

Item	Weld factor	Remarks
(1) General application:		except as required below
Watertight plate boundaries	0,34	
Non-tight plate boundaries	0,13	
Longitudinals, frames, beams, and other secondary members to shell, deck or bulkhead plating	0,10	
~~Longitudinals, frames, beams, and other secondary members to shell, deck or bulkhead plating~~	0,13	in tanks
	0,21	in way of end connections
Panel stiffeners, etc	0,10	
Overlap welds generally	0,27	
Longitudinals of the flat-bar type to plating		*see* Note 5
(2) Bottom construction in way of holds or tanks:		
Non-tight centre girder: to keel	0,27	
to inner bottom	0,21	no scallops
Non-tight boundaries of floors, girders and brackets	0,21	in way of 0,2 x span at ends
	0,27	in way of brackets at lower end of main frame
Watertight bottom girders	0,34	
Connection of girder to inner bottom in way of longitudinal bulkheads supported on inner bottom	0,44	

Inner bottom longitudinals or reverse frames	0,13	under holds strengthened for heavy cargoes
Connection of floors to inner bottom in way of plane bulkheads, bulkheads stools, or corrugated and double plate bulkheads supported on inner bottom. The supporting floors are to be continuously welded to the inner bottom	0,44	Weld size based on floor thickness Weld material compatible with floor material, *see* Note 4

Part 3, Chapter 12
Ventilators, Air Pipes and Discharges

■ *Section 2*
Ventilators

2.4 Machinery spaces

2.4.3 Where closing appliances are fitted to ventilators serving emergency generator rooms or ventilation louvres are used for emergency generator rooms, the following requirements are to be applied in addition to the requirements of *Pt 3, Ch 12, 2.4 Machinery spaces 2.4.2*:

(a) Ventilation louvres and closing appliances may either be hand-operated or power-operated (hydraulic/pneumatic/electric) and are to be operable under a fire condition.

(b) Hand-operated ventilation louvres and closing appliances are to be kept open during the normal operation of the vessel. Corresponding instruction notices are to be provided at the location where hand operation is provided.

(c) Power-operated ventilation louvres and closing appliances are to open automatically whenever the emergency generator is starting/in operation. Closed ventilation louvres and closing appliances are acceptable during normal operation of the vessel. In the event of power failure, the default position of the ventilation louvres or closing appliances is to be the open position.

(d) Ventilation openings are to be capable of being operated manually from a clearly marked safe position outside the space where the closing operation can be easily confirmed. The louvre status (open/closed) is to be indicated at this position. Such closing is not to be possible from any other remote position.

Part 3, Chapter 13
Ship Control Systems

Existing Section 3 has been deleted in its entirety.

■ *Section 3*
Fixed and steering nozzles

3.1 General

3.1.1 The requirements given in this Section are applicable to fixed and steering nozzles with an inner diameter of not greater than 5 metres.

3.1.2 For nozzles with an inner diameter greater than 5 metres, the maximum pressure acting on the nozzle is to be submitted by the designer. This pressure is to be used to determine the nozzle scantlings in accordance with the requirements of *Pt 3, Ch 13, 3.3 Nozzle scantlings* to *Pt 3, Ch 13, 3.5 Nozzle headbox*.

3.1.3 Suitable arrangements are to be provided to prevent the steering nozzle from lifting.

3.1.4 Effective means are to be provided for supporting the weight of the nozzle. The hull structure, in way of the nozzle supports, is to be suitably strengthened.

3.1.5 Care is to be taken in the manufacture of the nozzle to ensure its internal preservation and watertightness. The preservation and testing are to be as required for rudders, *see Pt 3, Ch 13, 2.11 Rudder blade, Pt 3, Ch 1, Table 1.9.1 Testing requirements* and *Pt 3, Ch 1, Table 1.8.2 Trial trip and operational tests*.

3.2 Design pressure

3.2.1 The design pressure for propeller nozzles, in kN/m^2, is to be determined as follows:

$$P_d = c_z P_{d0}$$

$$P_{d0} = \varepsilon c_f \frac{N}{A_p}$$

where

N is the maximum shaft power in kW

A_p is the propeller disc area, in m^2, taken equal to:

$$A_p = \frac{\pi \delta_p^2}{4}$$

δ_p is the propeller diameter in m

ε is a factor obtained from the following formula:

$$\varepsilon = 0{,}21 - 2 \times 10^{-4} \frac{N}{A_p}$$ but not to be taken less than 0,1

c_z is a coefficient taken equal to:

$c = 1{,}0$ in Zone 2 (propeller zone)

$c = 0{,}5$ in Zone 1

See also Figure 13.3.1 Nozzle construction

c_f is a coefficient taken equal to:

$c_f = 1{,}0$ for fixed nozzles

$c_f = 1{,}25$ for steering nozzles

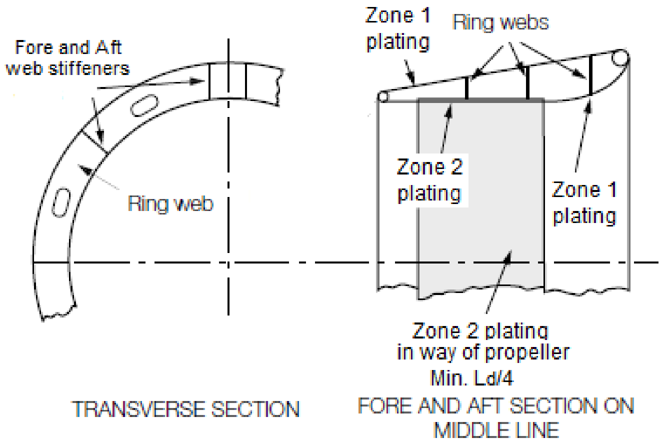
Fore and Aft web stiffeners
Ring web
Zone 1 plating
Ring webs
Zone 2 plating
Zone 1 plating
Zone 2 plating in way of propeller Min. Ld/4
TRANSVERSE SECTION
FORE AND AFT SECTION ON MIDDLE LINE

Figure 13.3.1 Nozzle construction

3.3 Nozzle scantlings

3.3.1 The scantlings of propeller nozzles are to be not less than required by *Table 13.3.1 Nozzle construction.*

Table 13.3.1 Nozzle construction

Item	Requirement
(1) Nozzle plating	$t = 5s\sqrt{P_d} + t_k$ but not less than 7,5 mm
(2) Ring webs and web stiffeners	Not less than the attached nozzle plating in way of Zone 1
(3) Webs in way of headbox and pintle support structure	$t_w = t + 4$ mm
(4) Section modulus of nozzle profile about its neutral axis	$Z = n \delta_p^2 L_d V^2$ cm^3

Symbols

P_d = nozzle design pressure, in kN/m^2, *see Pt 3, Ch 13, 3.2 Design pressure*

t = thickness of nozzle plating, in mm

t_w = thickness of web plating, in mm

s = spacing of web rings, in m

t_k = corrosion thickness, to be taken as:

$t_k = 2{,}5$ in general

$t_k = 1{,}0$ for stainless steel

δ_p = propeller diameter, in m

L_d = nozzle length, in m

n = coefficient taken equal to:

$n = 1{,}0$ for steering nozzles

$n = 0{,}7$ for fixed nozzles

V is as defined in *Pt 3, Ch 1, 6.1 Principal particulars*

3.3.2 The Zone 2 nozzle plating is to be carried well forward and aft of the propeller tips with due allowance being made on steering nozzles for the rotation of the nozzle in relation to the propeller, and is to extend at least 0,25 L_d in length.

3.3.3 Fore and aft web stiffeners are to be fitted between the inner and outer skins of the nozzle. Both sides of the headbox and pintle support structure, are to be connected to fore and aft webs of increased thickness.

3.3.4 The adjacent ring webs fore and aft of those connected to the headbox and pintle support structure are to be of a similar thickness to the ring webs connected to the headbox and pintle support structure.

3.3.5 Local stiffening is to be fitted in way of the top and bottom supports which are to be integrated with the web stiffeners and ring webs. Continuity of bending strength is to be maintained in these regions.

3.3.6 The plating thickness of attached fins is to be not less than the Zone 1 nozzle plating thickness. Solid fins should be not less than 25 mm thick.

3.4 Nozzle stock

3.4.1 The requirements for the nozzle stock are to be derived, in accordance with *Pt 3, Ch 13, 2.10 Rudder stock scantlings,* using the lateral nozzle force and maximum nozzle torque obtained in this sub-Section.

3.4.2 The lateral nozzle force, C_R , at the centre of pressure is to be determined as follows:

$$C_R = P_d A_t 10^3 \text{ N}$$

where

P_d = nozzle design pressure in Zone 2, in kN/m^2

A_t = total projected area of nozzle and supporting structure, in m^2

$$A_t = A_n + A_f + A_s$$

where

A_n = projected area of nozzle, in m^2, to be taken as $1{,}57 \delta_p L_d$

A_f = projected area of nozzle flap, in m^2

A_s = projected area of support structure in the longitudinal plane, in m^2

where δ_p and L_d are defined in *Table 13.3.1 Nozzle construction*.

3.4.3 The maximum nozzle torque, Q_R , is to be determined as follows:

$$Q_R = C_R \times r \text{ Nm}$$

where

$r =$ distance from the centre of pressure to the stock, in m, to be taken as:

$c(\alpha - k_1)$

$c =$ nozzle length plus the length of the nozzle flap if present

$\alpha =$ relative centre of pressure along the nozzle length, to be taken as:

$\alpha = 0{,}25$ for fixed nozzles

$\alpha = 0{,}33$ for steering nozzles

$k_1 =$ ratio of the nozzle area forward of the stock centreline to the combined area of the nozzle and flap

$$k_1 = \frac{A_1}{A_n + A_f}$$

A_1 is the portion of the projected nozzle area located forward of the stock centreline, *see also Figure 13.3.2 Nozzle geometry*

C_R , A_n and A_f are given in *Pt 3, Ch 13, 3.4 Nozzle stock, 3.4.2*.

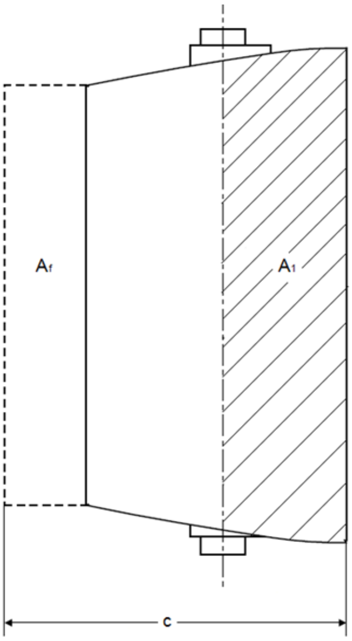

Figure 13.3.2 Nozzle geometry

3.5 Nozzle headbox

3.5.1 The section modulus of the headbox, Z, about the longitudinal axis is to be not less than:

$$Z = 0{,}143 P_d A_t D_H \times 10^2 \text{ cm}^3$$

where

$P_d =$ nozzle design pressure in Zone 2, in kN/m^2

$$D_H = \delta_h + \frac{\delta_p}{2}$$

where

$\delta_h =$ depth of headbox, in m

$\delta_p =$ propeller diameter, in m

A_t is given in *Pt 3, Ch 13, 3.4 Nozzle stock, 3.4.2*.

3.5.2 Plans detailing the integration of the headbox into the sternframe are to be submitted.

3.6 Ancillary items

3.6.1 Requirements for ancillary items such as bearings, couplings, pintles, etc. are given in *Pt 3, Ch 13, 2 Rudders*.

3.7 Welding

3.7.1 Double continuous welds are to be used as far as practicable for the connection between the inner and outer nozzle plating and the internal stiffening rings and webs. Slot welding is not permitted for the inner nozzle plating.

3.7.2 Additional welding requirements are given in *Pt 3, Ch 13, 2.4 Welding and design details*.

3.8 Azimuth thrusters

3.8.1 In general, the scantlings of similar structures, such as azimuth thrusters, are to be calculated in accordance with the requirements of *Pt 3, Ch 13, 3.3 Nozzle scantlings* where the design pressure, P_d, is to be derived from loads specified by the designer. The stock may be assessed using these loads and the permissible design stresses given in *Table 13.2.5 Rudder stock permissible stresses.*

■ *Section 7*
Equipment

7.4 Chain cables

7.4.1 An easy lead of the cables from the windlass to the anchors and chain lockers is to be arranged.

Existing paragraphs 7.4.1 *to* 7.4.5 *have been renumbered* 7.4.2 *to* 7.4.6*.*

■ *Section 8*
Windlass design and testing

8.2 Calculations

8.2.2 The maximum stress from load cases stated in *Table 13.8.2 Design load cases for* the *windlass ~~and chainstopper~~* are not to exceed the limits stated in *Table 13.8.3 Permissible stress for design load cases*.

Table 13.8.2 Design load cases for the windlass ~~and chainstopper~~

Load case	Condition	Note
1	Continuous pull	*See Pt 3, Ch 13, 8.1 Windlass design 8.1.2*
2	Overload pull	*See Pt 3, Ch 13, 8.1 Windlass design 8.1.2*
3	Brake holding load	*See Pt 3, Ch 13, 8.1 Windlass design 8.1.2*

8.10 Structural requirements associated with anchoring

8.10.2 ~~An easy lead of the cables from the windlass to the anchors and chain lockers is to be arranged. Where cables pass over or through stoppers, these stoppers are to be manufactured from ductile material and be designed to minimise the probability of damage to, or snagging of, the cable. They are to be capable of withstanding without permanent deformation a load equal to 80 per cent of the Rule breaking load of the cable passing over them.~~ Where cables pass through stoppers, these stoppers are to be manufactured from ductile material and be designed to minimise the possibility of damage to, or snagging of, the cable. They are to be capable of withstanding without permanent deformation a load equal to 80 per cent of the Rule breaking load of the cable passing over them. The allowable stresses specified in *Table 13.8.4 Allowable stresses in chain stopper supporting structure* are to be used to derive the net scantlings of the supporting structure. A corrosion addition of 2 mm is to be added to the net thickness derived.

Table 13.8.4 Allowable stresses in chain stopper supporting structure

	Permissible stress N/mm^2
Normal stress	1,00 σ_0
Shear stress	0,58 σ_0
Symbols	
σ_0 = specified minimum yield stress, N/mm^2	

8.10.8 ~~Provision is to be made for securing the inboard ends of the cables to the structure. This attachment should have a working strength of not less than 63,7 kN (6,5 tonne-f) or 10 per cent of the breaking strength of the chain cable, whichever is the greater, and the structure to which it is attached is to be adequate for this load. Attention is drawn to the advantages of arranging that the cable may be slipped from an accessible position outside the chain cable locker. The proposed arrangement for slipping the chain cable, if constructed outside the chain locker, must be made watertight.~~ Provision is to be made for securing the bitter end of the chain cable to the ship structure. The fastening for securing the bitter end is to be capable of withstanding a force of not less than 15 per cent and not greater than 30 per cent of the minimum breaking strength of the as fitted chain cable. It is to be provided with suitable means such that, in case of emergency, the chain cable may be easily slipped to sea from an accessible position outside the chain cable locker. Where the mechanism for slipping the chain cable to sea penetrates the chain locker bulkhead, this penetration is to be made watertight.

8.10.9 Alternatively the cable end connection may be accepted where it has been designed and constructed to a recognised National or International Standard.

8.10.10 The cable clench supporting structure is to be adequately stiffened in accordance with the breaking strength of the fastening provided.

Existing paragraphs 8.10.9 *to* 8.10.11 *have been renumbered* 8.10.11 *to* 8.10.13.

Part 4, Chapter 2
Ferries, Roll On-Roll Off Ships and Passenger Ships

■ *Section 3*
Deck Structure

3.1 Loading

Table 2.3.1 Design deck loadings (ferries and passenger ships only)

Deck		Design pressures P_s, in kN/m^2	
		Secondary structures	Primary structures
Internal Decks	Decks in way of accommodation and public spaces (including internal muster stations), *see* Note	6,38	~~3,12~~ 3,19
	Stairwell landing areas where people may congregate	6,38	6,38
	Deck supporting baggage spaces	3,53H_t	3,53H_t
	Decks in way of stores and refrigerated spaces	14,13	14,13
	Decks in way of workshop and machinery spaces (excludes A/C machinery spaces)	18,34	18,34
External Decks	Magradomes	2,45	2,45
	Balconies	3,92	1,96
	Weather exposed superstructure decks	2,26	2,26
	Weather exposed lifeboat deck, external muster stations	8,44	8,44
	Exposed decks subjected to sea loads	*See Pt 3, Ch 3, Table 3.5.1 Design heads and permissible cargo loadings*	
Symbols			
H_t = 'tween deck height, in metres			
Note The design pressure, P_s, may be reduced by 12 per cent for ferries and passenger ships with a specified operating area service notation.			

■ *Section 11*
Miscellaneous openings

11.4 Frame design and testing

11.4.3 **Structural testing**. A hydrostatic test is to be carried out in order to examine the capability of the frame, mullions and ~~glass~~ the retaining arrangement~~s~~ for the glazing. This is carried out by applying a test pressure of ~~4 H_d~~ 4H_d (H_d as calculated in *Pt 4, Ch 2, 11.3 Strength assessment of windows in large passenger ships for windows* and *Pt 4, Ch 2, 12.3 Weather design loads for balustrades*) to the external face of the window~~. Alternatively this test may be carried out using a steel plate in place of the glass. Ideally, the steel plate should be of a suitable reduced thickness in order to simulate the flexural performance of the glass.~~, utilising an aluminium alloy plate of appropriate temper and thickness to simulate the flexural response in lieu of the glazing. A full-scale test with actual glazing in place may be acceptable provided that the stresses induced are within allowable limits. Details of the calculations made and testing procedures are to be submitted for review prior to the test. Alternative means of demonstrating adequacy of frame, mullions and the retaining arrangement for the glazing may be specially considered.

Part 4, Chapter 3
Tugs

■ *Section 1*
General

1.2 Class notations

1.2.2 Tugs intended to be operated only in suitable areas or conditions which have been agreed by the Committee, as defined in *Pt 1, Ch 2, 2.3 Class notations (hull) 2.3.6* to *Pt 1, Ch 2, 2.3 Class notations (hull) 2.3.10*, will receive individual consideration on the basis of the Rules with respect to the environmental conditions agreed for the design basis and approval. In particular, tugs complying with the requirements of this Chapter and *Pt 3, Ch 13, 7 Equipment* for the relevant reduced equipment requirements, will be eligible to be classed:

- **A1 tug protected waters service**; or
- **A1 escort tug protected waters service**; or
- **A1 escort tug EPN (F,B,V,C) protected waters service**; ~~*see Pt 1, Ch 2, 2.3 Class notations (hull) 2.3.6*;~~ or
- **A1 escort tug EPN (CFD: F,B, V) protected waters service**; or
- **100A1 tug with service restriction notation**; or
- **100A1 escort tug with service restriction notation**; or
- **100A1 escort tug EPN (F,B,V,C) with service restriction notation**; or
- **100A1 escort tug EPN (CFD: F,B, V) with service restriction notation**;

whichever is applicable.

Table 3.1.1 Class notations

Class Notation	Applicable Sections
100A1 tug	*Pt 4, Ch 3, 1 General* to *Pt 4, Ch 3, 8 Fenders*
100A1 escort tug	*Pt 4, Ch 3, 1 General* to *Pt 4, Ch 3, 9 Escort operation, performance numeral and trials*, except *Pt 4, Ch 3, 9.3 Performance numeral and trials* and *Pt 4, Ch 3, 9.4 Computational Fluid Dynamics Predicted Performance*
100A1 escort tug EPN (F, B, V, C)	*Pt 4, Ch 3, 1 General* to *Pt 4, Ch 3, 9 Escort operation, performance numeral and trials* except *Pt 4, Ch 3, 9.4 Computational Fluid Dynamics Predicted Performance*
100A1 escort tug EPN (CFD: F, B, V)	*Pt 4, Ch 3, 1 Application* to *Pt 4, Ch 3, 9 Escort operation, performance numeral and trials* except *Pt 4, Ch 3, 9.3 Escort operation, performance numeral and trials*
Note Tugs which comply with the anchor handler requirements in *Pt 4, Ch 4, 1 General* to *Pt 4, Ch 4, 8 Transport and handling of limited amounts of hazardous and noxious liquid substances in bulk* will be eligible for the additional notation **anchor handler**.	

■ *Section 9*
Escort operation, performance numeral and trials

9.4 Computational Fluid Dynamics Predicted Performance

9.4.1 Where the performance of the escort tug during escort operation in indirect towing mode has been predicted and reported using computational fluid dynamics in accordance with the requirements of this Section and in lieu of full-scale performance trials, the vessel will be eligible to have **EPN (CFD: F,B,V)** appended to the **escort tug** notation, *see Pt 4, Ch 3, 1.2 Class notations 1.2.1*, *Pt 4, Ch 3, 1.2 Class notations 1.2.2* and *Pt 4, Ch 4, 1.2 Class notations 1.2.2*.

9.4.2 The computational fluid dynamics investigation is to include escort performance prediction with an escort speed equal to 8 knots and/or 10 knots.

9.4.3 A computational fluid dynamics report is to be submitted to LR for consideration. The performance prediction simulating the trials detailed in *Pt 4, Ch 3, 9.3 Performance numeral and trials* is to be carried out in accordance with LR's ShipRight Procedure titled *Guidelines for CFD Escort Tug Performance*.

9.4.4 The length of the towline in the computational fluid dynamics simulation is to represent a typical operating condition.

9.4.5 The report or a summary of the results obtained therein is to be kept on board the vessel and made available prior to the commencement of any full-scale performance trials.

Part 4, Chapter 8
Container Ships

■ *Section 1*
General

1.4 Information required

1.4.1 In addition to the information and plans required by *Pt 3, Ch 1, 5 Information required*, the following are to be submitted:

(a) Details of overlap arrangement of steps in decks and longitudinal bulkheads.
(b) Details of outline stowage arrangement of containers.
(c) Details of design container stack weights.
(d) Details of cell guides and supporting structure indicating the position of guides relative to hatch corners, and attachment to structural members.
(e) Details of reinforcement to structure in way of container corners/supports.
(f) Details of reinforcement to structure in way of lashing bridges where fitted.
(g) Details showing the location of all openings in decks within the cargo holds.
(h) Details of longitudinal girders supporting hatch coamings where fitted.
(i) Detailed arrangements for crack arrest design, *see Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates.*

■ *Section 2*
Materials

2.3 Requirements for use of thick steel plates

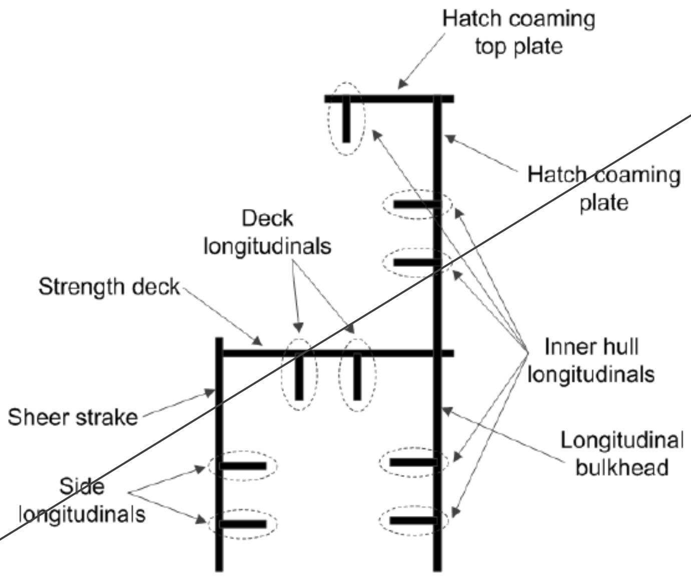

Figure 8.2.1 Upper flange longitudinal structural members

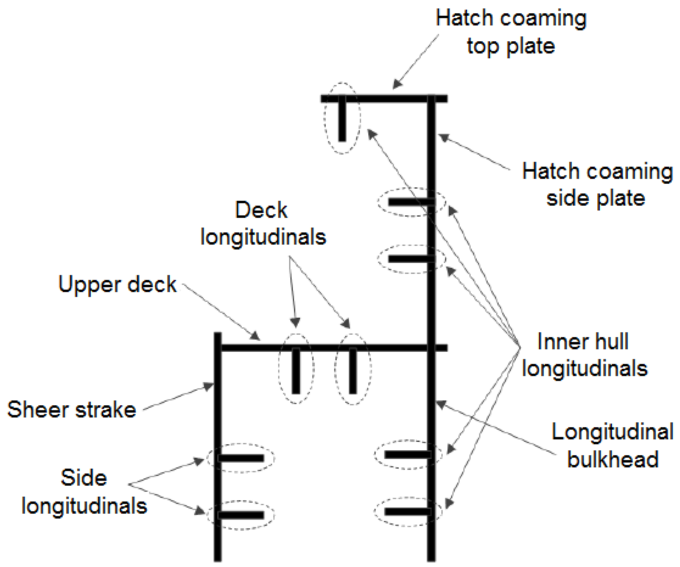

Figure 8.2.1 Upper flange longitudinal structural members

2.3.7 The following are considered to be acceptable examples of brittle crack arrest design for the case given in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.4* *(a):* ~~and *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.4*:~~

(a) Where the block-to-block butt welds of the hatch side coaming plate and those of the upper deck are staggered, this offset is to be greater than or equal to 300 mm. This offset distance is defined in *Figure 8.2.2 Minimum offset between block-to-block butt welds of the hatch side coaming* and those of the upper deck staggered. Brittle crack arrest steel, as defined in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.9*, is to be provided for the hatch side coaming plate.

(b) Where crack arrest holes are provided in way of the block-to-block butt welds at the region where the hatch side coaming weld meets the deck weld, *see Figure 8.2.3 Crack arrest hole in way of the block-to-block butt weld at the region where hatch side coaming weld meets the deck weld*, the corners of the crack arrest holes located where the hatch side coaming joints meet the deck weld are to be specially assessed for fatigue strength. The fatigue strength is also to be assessed at the location where the block-to-block butt weld intersects the crack arrest hole. Brittle crack arrest steel, as defined in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.9*, is to be provided for the hatch side coaming plate.

(c) Where higher crack arrest steel insert plates such as SUF (Surface Layer with Ultra~~s~~-Fine grain) steel or equivalent, or weld metal inserts with high crack arrest toughness properties are provided in way of the block-to-block butt welds at the region where hatch side coaming weld meets the deck weld. Brittle crack arrest steel, as defined in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.9*, is to be provided for the hatch side coaming plate.

2.3.8 For the cases given in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.4 (b)* and *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.4 (c),* the use of brittle crack arrest steel, as defined in *Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.9*, ~~is to be used~~ for the upper deck along the cargo hold region is considered to be an acceptable means to arrest a brittle crack initiating from the coaming side and top plate and propagating into the structure below.

2.3.12 As an alternative to crack arrest design, design based on crack initiation may be considered. Design based on this approach aims to prevent any defect from propagating into a brittle fracture by ensuring that no defect exists above a calculated size in the weld either during construction or subsequently in service. This size is determined by way of an Engineering Critical Assessment (ECA) which must be carried out and submitted to LR prior to construction. The ECA will determine the ~~minimum~~ maximum acceptable defect size from both fatigue crack growth and fracture mechanics calculations. The detectability of such a defect in the structure will also need to be proven to LR. This can only be achieved through assessment of the non-destructive examination techniques and procedures to be applied. It is anticipated that, for this approach to be successful, the application of advanced NDT, such as the Time of Flight Diffraction (TOFD) ~~T~~technique or the Phased Array Ultrasonic Testing (PAUT) technique, will be necessary. The approach will also need to include a programme of non-destructive testing during the lifetime of the ship in order to ensure that growth of a defect does not exceed the limits of the ECA.

2.3.13 *Table 8.2.1 Preventative measures to be used in design and construction for thick steel plates* summarises a selection of measures aimed at mitigating the risk of uncontrolled brittle fracture in way of deck and hatch coaming structure. A range of thicknesses is shown for the different strength grades of steel; where the maximum as-built thickness of the hatch coaming top plate and side plate falls within this range, measures are to be selected as shown in the Table. If the as-built thickness of the hatch coaming ~~structure~~ top plate and side plate is below the values contained in the Table, then additional measures are not necessary regardless of the thickness and yield strength of the upper deck plating.

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